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Culture feasibility of silver barb (*Barbodes gonionotus* Bleeker) and GIFT with shrimp (*Penaeus monodon* Feb.) in brackishwater pond

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Abstract
An experiment was conducted to understand the culture feasibility of sliver barb (*Barbodes gonionotus*) and GIFT (Genetically Improved Farmed Tilapia) with shrimp (*Penaeus monodon*). There were three different treatment (T) combinations: (T_1) shrimp (10,000/ha) and silver barb (10,000/ha), (T_2) shrimp (10,000/ha) and GIFT (10,000/ha), and (T_3) shrimp (10,000/ha). Shrimp, after 120 days of culture, attained an average weight of 23.77g in T_1, followed by T_3 (23.70g). The highest average weight was recorded in T_2 (24.93g). The specific growth rate (SGR) of shrimp was 6.9%, 6.94% and 6.9% for T_1, T_2 and T_3, respectively. The SGR for the *B. gonionotus* and GIFT was 2.56% and 4.26%, respectively. The final weight of silver barb was 69.75g and that of GIFT was 161.83g. Survival of shrimp was higher (65.50%) in T_2, followed by T3 (59.97%) and T_1 (57.03%). Survival rate of silver barb (58.10%) was lower compared to that of GIFT (78.43%). Sporadic and scanty mortality of silver barb with a symptom of blind-red-protruded eye, swollen belly and body lesion was observed. Production of shrimp was higher of 284.05 kg/ha in monoculture, followed 162.47 kg/ha in concurrent culture with silver barb and 136.77 kg/ha culture with GIFT. In spite of similar stocking density of *B. gonionotus* and GIFT in T1 and T2, respectively, the production of GIFT was higher (1272.95 kg/ha) than that of silver barb (402.72kg/ha). Survival, final weight and production rates of shrimp among the treatments were found insignificant while total production of shrimp/fish was found to vary significantly ($P<0.01$). Benefit cost ratios (BCR) were 1.04:1.0, 1.32:1.0 and 2.05:1.0 in the T_1, T_2 and T_3, respectively. Results indicate that, concurrent culture of *B. gonionotus* and shrimp will be less prospective in comparison to culture of GIFT and shrimp in brackishwater environment with a salinity range of 9 to 14‰.

Key words: *Penaeus monodon*, *Barbodes gonionotus*, GIFT, Brackishwater

Introduction

Traditional shrimp farming in the South-west region in Bangladesh is an age-old practice. At present about 0.17 million ha (Karim 2005) of tidally inundated lands are being utilized under such traditional culture system, which is locally known as *gher*

fishery. The major cropping pattern is the mono-crop of tiger shrimp (*Penaeus monodon*), cultured in a salinity range of 10-25 ppt in dry season (Krishna 1991). Present average production of shrimp in traditional system is not exceedingly 190 kg/ha/year (Rouf 2006). The successive culture in mono-crop system in *ghers* often results in crop loss due to mortality problem. The crop diversification instead of mono-crop shrimp culture practice may be an effective tool in controlling or diminishing shrimp mortality especially due to ecological and disease factors. On the other hand the cultural of *P. monodon* with any suitable short-grown fish species may help to increase or enhance the production in shrimp farms with an environment friendly situation. Silver barb (*Barbodes gonionotus*) an exotic fish in the country. It is a fast growing species widely cultured in freshwater and grow well in low salinity (Yang and Fitzsimmons, 2007) however, reported to survive in a wide range of salinity 0-17‰ (Hossain *et al.* 1999); eat a variety of foods. It grows on relatively low quality diet; largely vegetable protein (Hossain *et al.* 1994) and its seed are available throughout the country. Tilapia (*Oreochromis sp*) is another fish with an omnivorous and best-known detritivorous species (Bowen, 1981) and generally feeds on algae and minute animals. As GIFT (Anon 1998) has significantly higher growth performance (36-81%) than local strains of *O. niloticus* and has tolerance to a wide range of salinity, this improved strain of tilapia may be another suitable candidate for brackishwater aquaculture. So far, few or no work has been done on culture potentiality of silver barb and GIFT in shrimp *ghers* in Bangladesh and data were not available. This paper describes the culture feasibility of *B. gonionotus* and GIFT with shrimp (*P. monodon*) in brackishwater earthen ponds.

Materials and methods

The experiment was conducted during March to June 2006 at the Brackishwater Station of the Bangladesh Fisheries Research Institute, Paikgacha, Khulna. Six ponds of 2000 m^2 each in the pond complex were selected. The ponds were prepared by sun drying followed by liming with CaO @ 250 kg/ha and by fertilizing with mustard oil cake (MOC), di-ammonium phosphate (DAP) and urea @ 50, 20, and 10 kg/ha, respectively. A nursery enclosure of 40m^2 with fine meshed nylon-net was set up in each pond for nursing shrimp post larvae. After 7 days, the ponds were filled up to a depth of 80cm with tidal water through a feeder canal and left for about a week period for suitable water conditions.

Hatchery produced of *P. monodon* post larvae with an average weight of 0.006g were stocked in the nursery enclosures and nursed to grow juvenile. Silver barb (*B. gonionotus*) fingerling with an average weight of 3.24g and GIFT fry with an average weight of 0.98g were directly stocked to the ponds in March 2006 under three different treatments. The species combination and stocking density in Treatment-1 was *P. monodon* and *B. gonionotus* at 10,000/ha each; in Treatment-2 was *P. monodon* and GIFT at 10,000/ha each and in Treatment-3 was *P. monodon* at 20,000/ha. The juvenile *P. monodon* were allowed to spread over the entire pond at the 14th day, by up-folding the nylon net of nursery enclosure.

Shrimp and fish were fed with a prepared feed (containing 30% protein level). Percent composition of different ingredients of feed was fishmeal (29%), MOC (15%), rice bran (30%), soybean meal (16%), wheat flour (9%) and vitamin premix (0.1%). Feed application was done at the rate of 5~3% bw/day, twice at dawn and dusk.

Routine sampling was done during the experimental period. After 120 days of culture, both shrimp and fishes were harvested completed by dewatering the ponds and the growth and production were estimated.

Data was compiled and analyzed using software MS Excel and following Zaman *et al.* (1982). The total weight gain and specific growth rate was estimated as per Dhawan and Kaur (2002) following the formula given below.

$$TWG = \frac{\ln Final\ weight\ (g) - \ln Initial\ weight\ (g)}{Number\ of\ culture\ days} X\ 100$$

$$SGR\% = \frac{Final\ weight\ (g) - Initial\ weight\ (g)}{Initial\ weight\ (g)}$$

Results and discussion

The physicochemical parameters of the pond water are shown in Fig. 1. It reveals that, water temperature varied from 25 to 33^{0}C (Fig. 1b) and salinity ranged from 8.0 to 14‰ during the study period (Fig. 1c). Water transparency was recorded to vary from 17.0 to 60.0 cm (Fig. 1e) and depths from 62.5 to 90cm (Fig. 1f). There was no significant difference in physico-chemical parameters among the treatments. Concentration of plankton population and their variation are shown in the Fig. 2. Phytoplankton population was found within 8000 to 16000 No./litre (Fig. 2a) while zooplankton was found within 1000 to 9000 no./l (Fig. 2b). Benthic population was monitored and has been shown in the Fig. 2c. Amphipods was the major benthic population as well insect larvae was found with a ranged between 40/m^2 to 2540/m^2. Values of different water quality variables were found suitable for *P. monodon* and GIFT in agreement with Grey (1990) and Jung and Co (1988); however, salinity range of the present study (8.00-14.00‰) seems to be less suitable for *B. gonionotus.* Yang and Fitzsimmons (2007) reported better growth and survival of *B. gonionotus* when stocked in low salinity (range 0-5‰) with shrimps in Vietnam and Thailand.

Variations in growth rate of shrimp under different treatments are shown in Fig. 3. No significant growth variations of shrimp among the treatments were observed. Growth of silver barb seems to be slower than that of GIFT (Fig. 4). The slower growth of *B. gonionotus* might be due to salinity or unknown factors. However, Hossain *et al.* (1994) reported the growth 112-114g for *B. gonionotus* in the salinity at 5-6 ppt., which is lower than the present study. Shrimp attained its higher average weight in T-2 (24.93g), where shrimp was stocked with GIFT, followed by 23.77g with silver barb (T-1) and 23.70g with shrimp monoculture (T-3). The total weight gain for shrimp was estimated 4154.0 of T-2, higher than that of 3960.0 and 3949.0 of T-1 and T-3, respectively (Table 1).

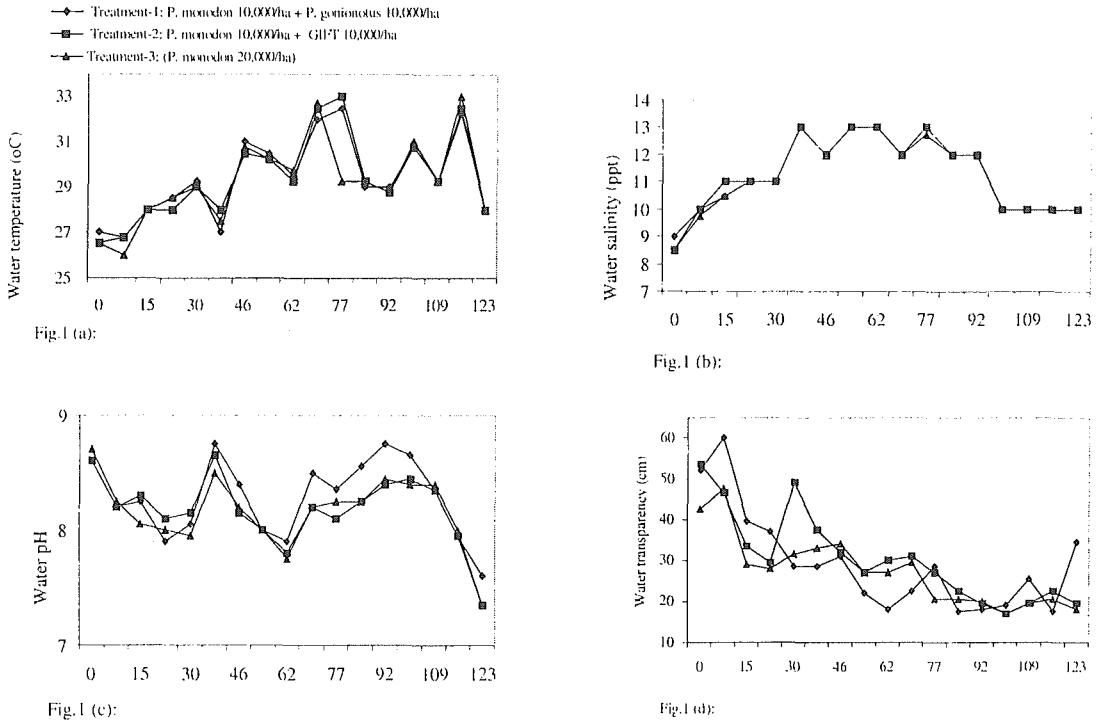

Fig.1 (a): Fig.1 (b):

Fig.1 (c): Fig.1 (d):

Fig. 1. Physico chemical parameter (a) water temperature, (b) salinity, (c) pH, and (d) Transparency in different ponds.

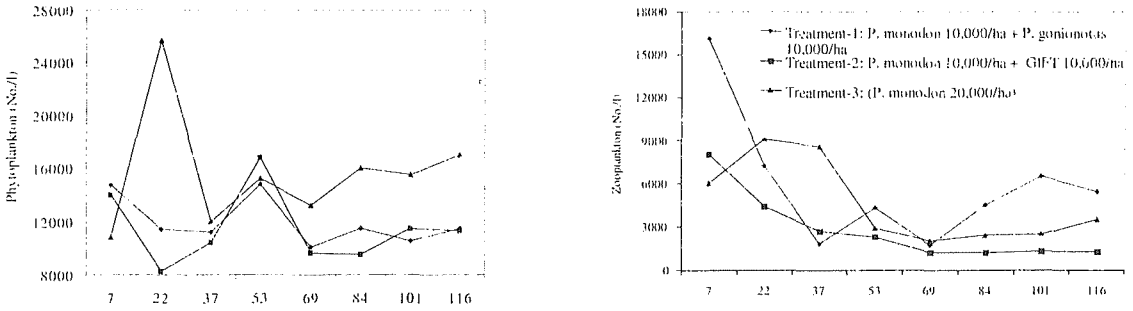

Fig.2(a) Fig.2(b)

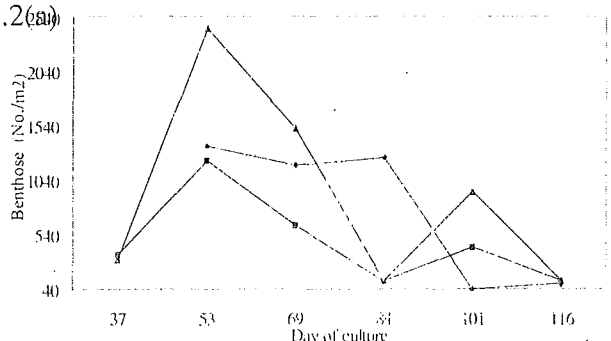

Fig. 2. Abundance of (a) phytoplankton (b) zooplankton, (c) benthos population in different treatments.

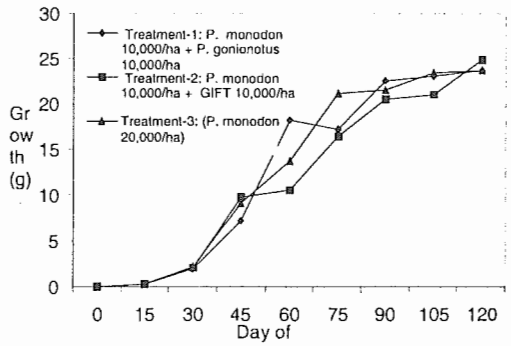

Fig. 3. Comparative growth of *P. monodon* in different treatment of culture

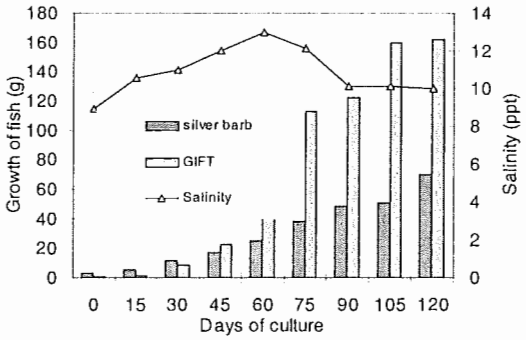

Fig 4. Salinity of water and growth of *B. gonionotus* and GIFT during the culture period.

Table 1. The growth performance and production of *Penaeus monodon, Barbodes gonionotus* and GIFT in different cultural treatments

Cultural treatments	Stocking No./ha	Initial wt. (g)	Final wt. (g)	TWG	SGR (%)	Survival (%)	Prod. (kg/ha)	Total prod. (kg/ha)	FCR
Treatment -1									
P. monodon	10,000	0.006 ±0.001	23.77 ±3.15	3961	6.90	57.03 ±7.67	136.77 ±36.23		2.62
B. gonionotus	10,000	3.24 ±1.13	69.75 ±12.11	21	2.56	58.10 ±2.05	402.73 ±41.24	539.50[b]	
(Concurrent culture)									
Treatment -2									
P. monodon	10,000	0.006 ±0.001	24.93 ±1.17	4154	6.94	65.50 ±9.77	162.47 ±13.22		2.29
GIFT	10,000	0.96 ±0.31	161.83 ±8.56	164	4.26	78.43 ±8.87	1272.95 ±210.17	1435.42[a]	
(Concurrent culture)									
Treatment -3									
P. monodon	20000	0.006	23.7 ±0.20	3949	6.90	59.97 ±11.84	284.05 ±53.68	284.05[b]	3.49
(mono culture)									

** P>0.01

The specific growth rate (SGR) of shrimp was 6.9%, 6.94% and 6.9% in Treatments 1, 2 and 3, respectively. However, the SGR for the *B. gonionotus* and GIFT was 2.56% and 4.26%, respectively (Table 3). The final weight of silver barb was 69.75g and that of GIFT was161.83g. The survival of shrimp was higher (65.50%) in Treatment-2, followed by Treatment-3 (59.97%) and in Treatment-1 (57.03%). The survival of *B. gonionotus* was

58.10%, which is lower than that of 78.43% of GIFT. Sporadic and scanty mortality of silver barb with a symptom of blind-red-protruded eye, swollen belly and body lesion was observed. Production of shrimp was higher of 284.05 kg/ha in monoculture, followed 162.47 kg/ha in concurrent culture with silver barb and 136.77 kg/ha in concurrent culture with GIFT. In spite of similar stocking density and ratio of silver barb: shrimp and GIFT: shrimp, production of GIFT (1272.95kg/ha) was higher than that of silver barb (402.72 kg/ha). The survival, final weight and production of shrimp were insignificant. The total production was significant ($P<0.01$).

References

Anon, 1998. Dissemination and evaluation of genetically improved tilapia species in Asia (DEGITA).Final report. *The International Center for Living Aquatic Resources Management (ICLARM).* 151 p.

Bowen, S.H., 1981. Digestion and assimilation of periphytic detrital aggregate by Tilapia mossambica. *Trans. Am. Fisc. Soc.,* **110** (2): 239-245.

Dhawan A. and S. Kaur, 2002. Pig dung as pond manure: Effect on water quality, pond productivity and growth of carps in polyculture system. *NAGA, The ICLARM Quarterly.* 25 (1): 11-14.

Grey, C.W., 1990. A guide to shrimp and prawn culture in Bangladesh. Institute of Aquaculture, University of Stirling, Stirling FK9 4LA, Scotland, U.K. 49 p.

Hossain, M.A., K.A. Haq, M. A Hossain and N. Sultana, 1994. Mixed culture of gaint sea bass, *Lates calcarifer* with tilapia and other species. Final report. Fisheries Research Institute, Mymensingh 2201. Bangladesh. pp.37

Hossain, M.A., N. Sultana and M.N. Islam, 1999. Development of improved methods for the culture of some important marine and hyposaline organism. Final report. MFTS, Bangladesh Fisheries Research Institute, Mymensingh-2201, Bangladesh. 40 pp.

Jung, C.K and W.G. CO, 1988. Prawn culture, scientific and practical approach. Westpoint Aquaculture Inc., Nable St., Dagupan City, Philippine. 115-125 pp.

Karim, M., 2005. Problems and Recommendation on the production of WSSV free bleack tiger shrimp fry. Compendium (in Bengali) National Fish Fortnight 2005. Department Fisheries. Ministry of Fisheries and Livestock, Bangladesh.102-106p.

Krishna, G.G., 1991. Extensive and semi-intensive culture systems of prawn. *In:* aquaculture Productivity, V.R.P. Sinha and H.C. Srivastava (eds.). Proceedings of the Symposium on Aquaculture Productivity held in December 1988 under aegis of Hindustan Lever Research Foundation. 201-209 pp.

Rouf, M.A., 2006. Environmental capacity management of shrimp culture in South-west coastal region of Bangladesh. TROPECA Monograph. 70 pp.

Yang, Y. and K. Fizsimmons, 2007. Survey of tilapia-shrimp polyculture in Thailand. Aquaculture CRSP 21ST, Annual Technical Report. pp1-17.

Zaman, S.M.H., K. Rahim and M. Howlader, 1082. Simple lesson from biometry (Manual). The Bangladesh Rice Res. Ins., Joydebpur, Dhaka. 171 pp.

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